

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 March 2000 (30.03.2000)

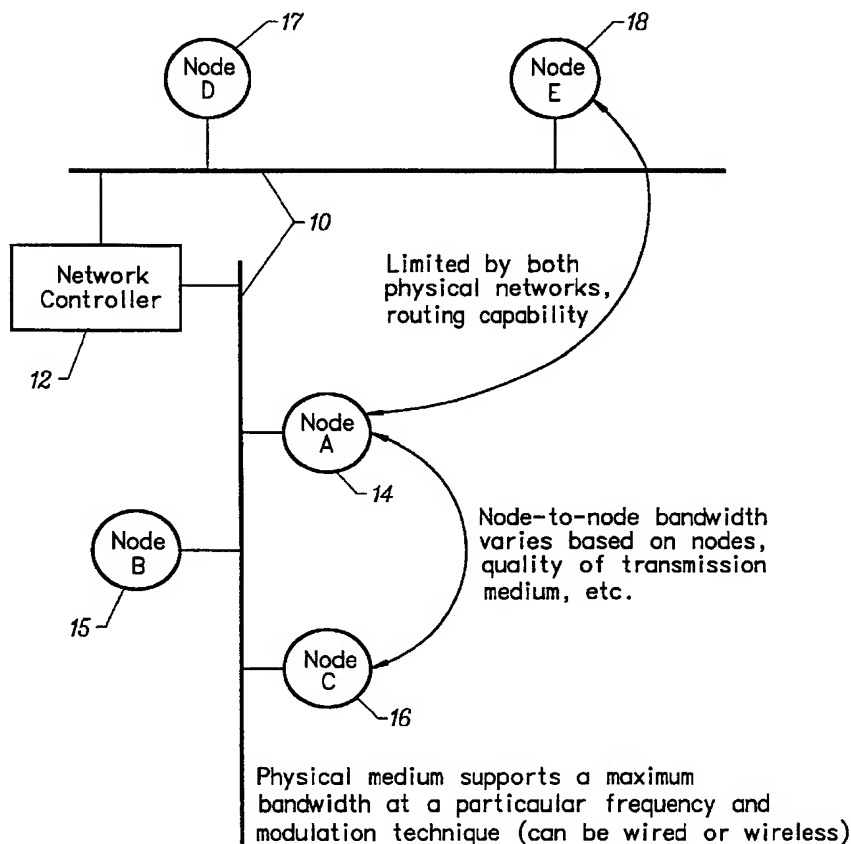
PCT

(10) International Publication Number
WO 00/18108 A3

- (51) International Patent Classification⁷: **H04L 12/64**, 12/403, 12/407 (74) Agents: **GLENN, Michael, A.** et al.; Glenn Patent Group, 3475 Edison Way, Suite L, Menlo Park, CA 94025 (US).
- (21) International Application Number: PCT/US99/16113 (81) Designated States (*national*): AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 15 July 1999 (15.07.1999)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
09/135,753 18 August 1998 (18.08.1998) US
- (71) Applicant: **TIVO, INC.** [US/US]; Suite 100, 894 Ross Drive, Sunnyvale, CA 94089 (US).
- (72) Inventor: **BARTON, James, M.**; 101 Sund Avenue, Los Gatos, CA 95030 (US).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— With international search report.

[Continued on next page]

(54) Title: METHOD AND APPARATUS IMPLEMENTING A MULTIMEDIA DIGITAL NETWORK



(57) Abstract: A method and apparatus for efficiently managing the allocation of available data capacity on a physically shared digital network among devices connected to that network is disclosed. Also disclosed is a method and apparatus for managing the ongoing timely movement of data on the shared network such that precise long-term data rates are achieved between attached devices with minimal additional buffering. The invention further comprises a method and apparatus which allows the use of any remaining network capacity for non time-critical data movement without the need for centralized access management.



(88) Date of publication of the international search report:
18 January 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/16113

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/64 H04L12/403 H04L12/407

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 596 651 A (NAT SEMICONDUCTOR CORP) 11 May 1994 (1994-05-11) abstract figures 2,4 claims 1,2,16,18 page 3, line 27 -page 5, line 23 -/-	1 7-10, 16-24, 27, 33-36, 42, 43, 46-50

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *8* document member of the same patent family

Date of the actual completion of the international search

26 June 2000

Date of mailing of the international search report

11.07.00

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Cichra, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/16113

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 97 39556 A (PEAK AUDIO INC) 23 October 1997 (1997-10-23) abstract figures 1-3,7,8 claims 1,4,7,12 page 3, line 5 -page 4, line 7 ---	1 7-10,16, 17, 20-25, 27, 33-35, 42-51
X A	MOORWOOD A: "IMPLEMENTING A MULTIMEDIA CAPABLE NETWORK USING ATM AND IEEE 802.9A(ISOCHRONOUS ETHERNET) TRANSPORT TECHNOLOGIES" WESCON CONFERENCE,US,IEEE CENTER, HOES LANE,27 September 1994 (1994-09-27), pages 16-21, XP000532558 ISSN: 1044-6036 the whole document	1 7,9-17, 20,27, 33,35, 42,46
X A	WORSLEY D J ET AL: "ISOCHRONOUS ETHERNET-AN ATM BRIDGE FOR MULTIMEDIA NETWORKING" IEEE MULTIMEDIA,US,IEEE COMPUTER SOCIETY, vol. 4, no. 1, 1 January 1997 (1997-01-01), XP000685699 ISSN: 1070-986X the whole document	1 7,8,16, 17, 20-25, 27,33, 35,42,46
X A	US 5 771 350 A (KIM DONG WON) 23 June 1998 (1998-06-23) abstract claims 1,3,7 figures 1,2 column 2, line 34 -column 4, line 8 --- -/--	1 7,16,20, 27,33, 42,46

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/16113

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>MARSAN M A ET AL: "Fairness and efficiency of slot reuse algorithms in DQDB MANS"</p> <p>COMPUTER COMMUNICATIONS,NL,ELSEVIER SCIENCE PUBLISHERS BV, AMSTERDAM, vol. 20, no. 15, 15 December 1997 (1997-12-15), pages 1323-1341, XP004107398</p> <p>ISSN: 0140-3664</p> <p>abstract</p> <p>figures 1-5</p> <p>paragraphs '2.3.3!-'2.4.3!</p> <p>paragraph '04.1!</p> <p style="text-align: center;">----</p>	<p>2-6,26, 28-32,52</p>
A	<p>RADHAKRISHNAN S ET AL: "A flexible traffic shaper for high speed networks: design and comparative study with leaky bucket"</p> <p>COMPUTER NETWORKS AND ISDN SYSTEMS,NL,NORTH HOLLAND PUBLISHING. AMSTERDAM, vol. 28, no. 4, 1 February 1996 (1996-02-01), pages 453-469, XP004002978</p> <p>ISSN: 0169-7552</p> <p>abstract</p> <p>page 459, column 1, line 9 -page 461, column 2, line 8</p> <p style="text-align: center;">----</p>	<p>2-6,26, 28-32,52</p>
A	<p>REN W ET AL: "Multipoint-to-multipoint ABR service in ATM"</p> <p>COMPUTER NETWORKS AND ISDN SYSTEMS,NL,NORTH HOLLAND PUBLISHING. AMSTERDAM, vol. 30, no. 19, 14 October 1998 (1998-10-14), pages 1793-1810, XP004147426</p> <p>ISSN: 0169-7552</p> <p>abstract</p> <p>paragraph '04.2!</p> <p>figure 6</p> <p>paragraph '06.1!</p> <p style="text-align: center;">----</p>	<p>2,3,6, 26,28, 29,32,52</p>
A	<p>US 4 587 650 A (BELL JOHN L)</p> <p>6 May 1986 (1986-05-06)</p> <p>cited in the application</p> <p>the whole document</p> <p style="text-align: center;">-----</p>	<p>2,26,28, 52</p>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 99/16113

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1,7-25,27,33-51

Method and apparatus for allocating data capacity on a shared network providing an on-demand packet based service and an streaming media service (isochronous) by

computing a transmission schedule indicating when each connected device is permitted to transmit and

indicating unscheduled portions of network bandwidth.

2. Claims: 2-6,26,28-32,52

Method and apparatus for allocating data capacity on a shared network providing a network interface component with:

a counter and a register

where access to the network is regulated by comparing the values of counter and register.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/16113

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0596651 A	11-05-1994	JP 6284130 A	07-10-1994
		US 5594734 A	14-01-1997
		US 5566169 A	15-10-1996
		US 5550802 A	27-08-1996
		US 5521928 A	28-05-1996
		US 5668811 A	16-09-1997
WO 9739556 A	23-10-1997	US 5761430 A	02-06-1998
		AU 2453397 A	07-11-1997
		EP 0832530 A	01-04-1998
US 5771350 A	23-06-1998	NONE	
US 4587650 A	06-05-1986	CA 1246177 A	06-12-1988
		DE 3586872 A	14-01-1993
		DE 3586872 T	01-04-1993
		EP 0180448 A	07-05-1986
		JP 1598903 C	28-01-1991
		JP 2025319 B	01-06-1990
		JP 61108287 A	26-05-1986